

Response to Office Action Mailed June 20, 2003

A. Claim in the Case

Claims 6-32 are rejected. Claims 6-15, 17-30, and 32 are pending. Claims 6, 14, 31 and 32 have been amended. Claims 16 and 31 have been cancelled.

B. Amendments

Applicant submits that the amendments made to the claims were made to correct claim drafting errors and to further define the scope of the claims. The amendments were not made in response to the cited art. Furthermore, Applicant submits that the amendments were not made to broaden the scope of the claims.

C. The Claims Are Not Anticipated by Toida et al. et al. Pursuant To 35 U.S.C. § 102(a)

The Examiner rejected claims 6-29, and 31-32 under 35 U.S.C. § 102(a) as being unpatentable over U.S. Patent No. 5,877,265 to Toida et al. (hereinafter "Toida").

The standard for "anticipation" is one of fairly strict identity. To anticipate a claim of a patent, a single prior source must contain all the claimed essential elements. *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 U.S.P.Q.81, 91 (Fed.Cir. 1986); *In re Donahue*, 766 F.2d 531, 226 U.S.P.Q. 619, 621 (Fed.Cir. 1985).

Independent claims 6 and 31 are directed towards a solid titanium catalyst that is described by a combination of features including, but not limited to, the features of:

preparing a magnesium compound solution by contacting a magnesium halide compound with an alcohol;

preparing a second solution by reacting the magnesium compound solution with an ester compound and a first silicon compound, wherein the first silicon compound comprises a silicon compound having an alkoxy group; and

reacting the second solution with a mixture of a titanium compound and a second silicon compound to produce the solid titanium catalyst, the second silicon compound comprising a silicon halide.

Applicant submits that Toida does not appear to teach or suggest the features of the claims including, but not limited to, the successive reactions of a magnesium compound solution with an ester compound and a silicon alkoxy compound, and reaction of the resulting product with a titanium compound and a silicon halide compound. Toida appears to teach a solid titanium catalyst that is formed by the reaction of a magnesium compound solution with a compound having at least two ether linkages, an electron donor compound and a titanium compound. Toida states:

Now, description will be made with respect to compounds used in the process for preparing a solid titanium catalyst component according to the present invention, i.e., a halogenated magnesium compound, a compound selected from the group consisting of an alcohol, an ether and an ester, especially an alcohol, a hydrocarbon solvent, a compound having at least two ether linkages existing through a plurality of atoms, a liquid titanium compound and an electron donor (f) other than the compound having at least two ether linkages existing through a plurality of atoms.
(Toida, column 4, lines 1-11).

In FIGS. 1 and 2, explanatory views are indicated to illustrate a process for preparing the catalyst for olefin polymerization according to the present invention.
(Toida, column 11, lines 65-67).

The Examiner agrees that the method of Toida differs from Applicant's claimed method. The Examiner states "while the catalyst of Toida is not made by the same process, the catalyst is

the same as the claimed catalyst." Applicant respectfully disagrees. For most titanium based olefin polymerization catalysts their catalytic activity and the properties of the polymers produced by the catalysts, depend on the structural characteristics of the catalysts. While catalysts may have the same empirical formula (i.e., the same or similar number and types of atoms), the properties of the catalyst may differ depending on the particular arrangement of the atoms. The particular arrangement of the various atoms of a titanium catalyst is determined by the method used to prepare the catalyst, more particularly, the time and or order in which each of the substituents are combined influences the final structure of the catalyst.

Toida describes a series of processing steps that differ from Applicant's claimed process. For example, Toida states:

In the preparation of the solid titanium catalyst component, first, the above-mentioned halogenated magnesium compound is contacted with the above-mentioned alcohol in the above-mentioned hydrocarbon solvent to obtain a homogeneous solution (magnesium compound solution) in which the halogenated magnesium compound is dissolved in a solvent of a mixture of the alcohol and the hydrocarbon.

(Toida, col. 9, l. 49-56)

Subsequently, the magnesium compound solution is contacted with the compound having at least two ether linkages existing through a plurality of atoms to obtain a homogeneous solution (magnesium polyether solution).

(Toida, col. 9, l. 66 - col. 10, l. 2)

Toida appears to teach the preparation of a "magnesium polyether solution" by contacting a magnesium compound solution with an ether compound. The ether compound, in some embodiments, may include a silicon compound. Applicant's claims are directed to forming a second solution by contacting "a magnesium compound solution with an ester compound and a first silicon compound." The reaction of a magnesium compound

solution with an ester and a silicon will produce an intermediate product that is different than the intermediate product described by Toida.

Toida further teaches that:

Thereafter, the magnesium polyether solution is contacted with the liquid titanium compound to obtain a liquid mixture containing the halogenated magnesium compound and the liquid titanium compound (magnesium titanium solution). (Toida, col. 10, l. 11 - 14)

In the present invention, after contacting the magnesium polyether solution with the liquid titanium compound, the magnesium titanium solution may be further contacted with an electron donor. When the contact with the electron donor is effected, it is preferred that the magnesium titanium solution be heated prior to the contact. The compound having at least two ether linkages existing through a plurality of atoms, for use as the electron donor, may be identical with or different from that employed in the preparation of the magnesium polyether solution. (Toida, col. 10, l. 28-37)

Toida appears to teach that the resulting magnesium polyether solution is reacted with a titanium compound. After reaction of the magnesium solution is completed, an electron donor may be added. Applicant's claims are directed to a method of forming a mixture of a titanium compound and a silicon compound. This titanium/silicon mixture is reacted with the previously described second solution (i.e., a mixture of the magnesium compound solution, an ester, and a silicon compound) to form the catalyst. Applicant contends that this order of addition would produce products that are not anticipated by Toida. The mixing of a silicon compound with the titanium compound prior to reaction with the second solution is substantially different than the teachings of Toida. The mixing of the silicon compound with titanium would allow reaction of the silicon with the titanium to occur prior to introducing any magnesium. As such the resulting compound would differ from any product obtained by reacting just a titanium compound with a magnesium solution.

Applicant therefore submits that Toida does not appear to teach or suggest the product of claim 6. As such, Applicant submits that independent claim 6 is patentable over Toida.

D. The Claims Are Not Anticipated by Lee et al. et al. Pursuant To 35 U.S.C. § 102(e)

The Examiner rejected claims 6-32 under 35 U.S.C. § 102(a) as being unpatentable over U.S. Patent No. 6,291,385 to Lee et al. (hereinafter "Lee").

The standard for "anticipation" is one of fairly strict identity. To anticipate a claim of a patent, a single prior source must contain all the claimed essential elements. *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 U.S.P.Q.81, 91 (Fed.Cir. 1986); *In re Donahue*, 766 F.2d 531, 226 U.S.P.Q. 619, 621 (Fed.Cir. 1985).

Independent claims 6 and 30 are directed towards a solid titanium catalyst and a method to prepare the catalyst that include a combination of features including, but not limited to, the features of:

preparing a magnesium compound solution by contacting a magnesium halide compound with an alcohol;

preparing a second solution by reacting the magnesium compound solution with an ester compound and a first silicon compound, wherein the first silicon compound comprises a silicon compound having an alkoxy group; and

reacting the second solution with a mixture of a titanium compound and a second silicon compound to produce the solid titanium catalyst, the second silicon compound comprising a silicon halide.

Lee appears to teach reacting a magnesium solution with an ester compound and a silane compound followed by addition of a titanium compound.

Lee states:

The catalyst of the present invention is produced by (1) producing a liquid magnesium solution by reacting a mixture of a magnesium compound and an aluminum compound with alcohol in a solvent of inert hydrocarbon, (2) getting the liquefied magnesium solution to react with an ester compound having at least one hydroxy group and a silane compound having at least one alkoxy group, as electron donors, and then by reacting it by addition of a titanium compound...
(Lee, column 2, lines 19-29)

Applicant's claims are directed to a process and product produced by a process in which "a second solution [is reacted] with a mixture of a titanium compound and a second silicon compound to produce the solid titanium catalyst, the second silicon compound comprising a silicon halide." Applicant contends that this order of addition would produce products that are not anticipated by Lee. The mixing of a silicon compound with the titanium compound prior to reaction with the second solution is substantially different than the teachings of Lee. Lee teaches that the liquefied magnesium solution is reacted with only a titanium compound. Lee does not teach the mixing of a silicon compound with the titanium compound. The mixing of the silicon compound with titanium would allow reaction of the silicon with the titanium to occur prior to introducing any magnesium. As such, the resulting compound would differ from any product obtained by reacting just a titanium compound with a magnesium solution.

Applicant submits that Lee does not appear to teach or suggest all the features of claims 6 and 30. As such, Applicant submits that claims 6 and 30 are patentable over Lee.

E. Many Of The Dependent Claims Are Separately Patentable

The Examiner is also respectfully requested to separately consider each of the dependent claims for patentability. Many of the dependent claims in addition to those mentioned above are independently patentable.

For instance, claim 7 states in part, "wherein the produced solid titanium catalyst is further reacted with a second titanium compound." The features of claim 7, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 8 states in part, "wherein the ester compound comprises an ester compound having at least one hydroxy group." The features of claim 8, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 9 states in part, "wherein the ester compound comprises an unsaturated aliphatic ester having at least one hydroxy group." The features of claim 9, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 10 states in part, "wherein the ester compound comprises 2-hydroxy ethylacrylate, 2-hydroxyethylmethacrylate, 2-hydroxy propyl acrylate, 2-hydroxy propylmethacrylate, 4-hydroxybutylacrylate, or pentaerithritol triacrylate." The features of claim 10, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 11 states in part, "wherein the ester compound comprises an aliphatic monoester having at least one hydroxy group or an aliphatic polyester having at least one hydroxy group." The features of claim 11, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 12 states in part, "wherein the ester compound comprises 2-hydroxy ethyl acetate, methyl 3-hydroxy butylate, ethyl 3-hydroxy butylate, methyl 2-hydroxy isobutylate, ethyl 2-hydroxy isobutylate, methyl 3-hydroxy-2-methyl propionate, 2,2-dimethyl-3-hydroxy propionate, ethyl-6-hydroxy hexanoate, t-butyl-2-hydroxy isobutylate, diethyl-3-hydroxy glutarate, ethyllactate, isopropyl lactate, butyl-isobutyl lactate, isobutyl lactate, ethyl mandelate, dimethyl ethyl tartrate, ethyl tartrate, dibutyl tartrate, diethyl citrate, triethyl citrate, ethyl-2-hydroxy-caproate, or diethyl *bis*-(hydroxymethyl) malonate." The features of claim 12, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 13 states in part, "wherein the ester compound comprises an aromatic ester having at least one hydroxy group." The features of claim 13, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Amended claim 14 states in part, "wherein the ester compound comprises 2-hydroxy ethyl benzoate, 2-hydroxy ethyl salicylate, methyl-4-(hydroxy methyl) benzoate, methyl-4-hydroxy benzoate, ethyl-3-hydroxy benzoate, 4-methyl salicylate, ethyl salicylate, phenyl salicylate, propyl-4-hydroxy benzoate, phenyl-3-hydroxy naphthanoate, monoethylene glycol monobenzoate, diethylene glycol benzoate, or triethylene glycol monobenzoate." The features of claim 14, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 15 states in part, "wherein the ester compound comprises an alicyclic ester having at least one hydroxy group." The features of claim 15, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 16 states in part, "wherein the first silicon compound comprises a silicon compound having an alkoxy group." The features of claim 16, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 17 states in part, "wherein the first silicon compound comprises the general formula $R^1_nSi(OR^2)_{4-n}$, wherein R^1 comprises a hydrocarbon having between 1 to 12 carbons, wherein R^2 comprises a hydrocarbon having between 1 to 12 carbons, and wherein n comprises an integer between 0 and 3." The features of claim 17, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 18 states in part, "wherein the first silicon compound comprises dimethyldimethoxy silane, dimethyldiethoxy silane, diphenyldimethoxy silane, methylphenyldimethoxy silane, diphenyldiethoxy silane, ethyltrimethoxy silane, vinyltrimethoxy silane, methyltrimethoxy silane, phenyltrimethoxy silane, methyltriethoxy silane, ethyltriethoxy silane, vinyltriethoxy silane, butyltriethoxy silane, phenyltriethoxy silane, ethyltriisopropoxy silane, vinyltributoxy silane, ethylsilicate, butylsilicate, or methyltriaryloxy silane." The features of claim 18, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 19 states in part, "wherein the titanium compound comprises the general formula $Ti(OR)_aX_{4-a}$, wherein R comprises an alkyl group with 1 to 20 carbon atoms, wherein X comprises a halogen atom, and wherein a comprises an integer between 0 and 4." The features of claim 189, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 20 states in part, "wherein the titanium compound comprises a titanium tetrahalide, wherein the titanium tetrahalide comprises $TiCl_4$, $TiBr_4$, or TiI_4 ." The features of claim 20, in

combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 21 states in part, "wherein the titanium compound comprises an alkoxy-titanium trihalide, wherein the alkoxy-titanium trihalide comprises $\text{Ti}(\text{OCH}_3)\text{Cl}_3$, $\text{Ti}(\text{OC}_2\text{H}_5)\text{Cl}_3$, $\text{Ti}(\text{OC}_2\text{H}_5)\text{Br}_3$, or $\text{Ti}(\text{O}(\text{i-C}_4\text{H}_9))\text{Br}_3$." The features of claim 21, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 22 states in part, "wherein the titanium compound comprises an alkoxy-titanium dihalide, wherein the alkoxy-titanium dihalide comprises $\text{Ti}(\text{OCH}_3)_2\text{Cl}_2$, $\text{Ti}(\text{OC}_2\text{H}_5)_2\text{Cl}_2$, $\text{Ti}(\text{OC}_2\text{H}_5)_2\text{Br}_2$, or $\text{Ti}(\text{O}(\text{i-C}_4\text{H}_9))_2\text{Cl}_2$." The features of claim 22, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 23 states in part, "wherein the titanium compound comprises a tetraalkoxy-titanium compound, wherein the tetraalkoxy-titanium compound comprises $\text{Ti}(\text{OCH}_3)_4$, $\text{Ti}(\text{OC}_2\text{H}_5)_4$, or $\text{Ti}(\text{OC}_4\text{H}_9)_4$." The features of claim 23, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 24 states in part, "wherein the second silicon compound comprises the general formula $\text{R}_n\text{SiCl}_{4-n}$, wherein R comprises hydrogen, or R comprises an alkyl group, an alkoxy group, a haloalkyl group, or an aryl group having 1 to 10 carbon atoms, or R comprises a halosilyl group or a halosilyl alkyl group having 1 to 8 carbon atoms, and wherein n comprises an integer between 0 and 4." The features of claim 24, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 25 states in part, "wherein the second silicon compound comprises silicon tetrachloride." The features of claim 25, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 26 states in part, "wherein the second silicon compound comprises a trichlorosilane, wherein the trichlorosilane comprises methyltrichlorosilane, ethyltrichlorosilane, or phenyl-trichlorosilane." The features of claim 26, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 27 states in part, "wherein the second silicon compound comprises a dichlorosilane, wherein the dichlorosilane comprises dimethyldichlorosilane, diethyldichlorosilane, diphenyldichlorosilane, or methylphenyldichlorosilane." The features of claim 27, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 28 states in part, "wherein the second silicon compound comprises trimethylchlorosilane." The features of claim 28, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 29 states in part, "wherein the ester compound comprises 2-hydroxyethyl methacrylate, wherein the first silicon compound comprises silicon tetraethoxide, wherein the titanium compound comprises titanium tetrachloride, and wherein the second silicon compound comprises silicon tetrachloride." The features of claim 29, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

Claim 32 states in part, "wherein an amount of the mixture of the titanium compound and the second silicon compound is about 0.1 moles per mole of the magnesium halide compound to

about 200 moles per mole of the magnesium halide compound, and wherein a molar ratio of the titanium compound to the second silicon compound in the mixture is between about 0.05 and about 0.95.” The features of claim 32, in combination with the features of independent claim 6, do not appear to be taught or suggested by the prior art.

F. Summary

Based on the above, Applicant respectfully requests favorable reconsideration.

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09/980,168

If any extension of time is necessary, Applicant hereby requests the appropriate extension of time. If any fees are inadvertently omitted or if any fees are required, please charge those fees to Meyertons, Hood, Kivlin, Kowert & Goetzel, P.C. Deposit Account Number 50-1505/5333-02500/EBM

Respectfully submitted,



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